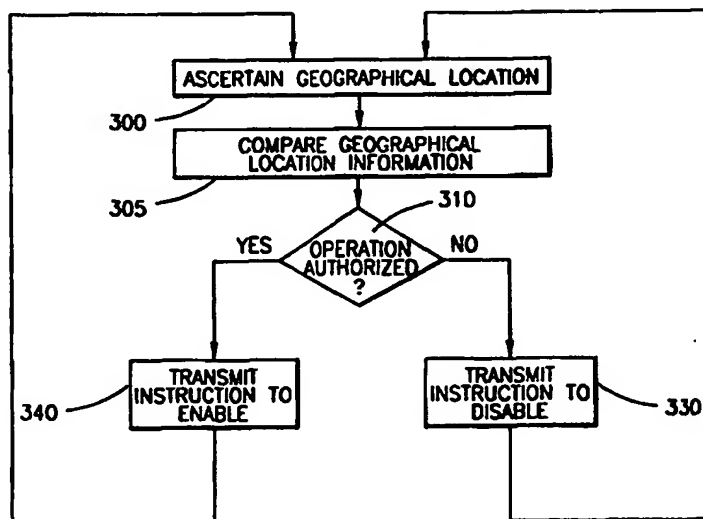




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04Q 7/38		A1	(11) International Publication Number: WO 98/57518
			(43) International Publication Date: 17 December 1998 (17.12.98)
(21) International Application Number: PCT/US98/10777 (22) International Filing Date: 9 June 1998 (09.06.98) (30) Priority Data: 08/872,246 10 June 1997 (10.06.97) US (71) Applicant: ERICSSON INC. [US/US]; 7001 Development Drive, P.O. Box 13969, Research Triangle Park, NC 27709 (US). (72) Inventor: VALENTINE, Eric; 1600 Brazos Trail, Plano, TX 75075 (US). (74) Agents: MOORE, Stanley, R. et al.; Jenkins & Gilchrist, P.C., Suite 3200, 1445 Ross Avenue, Dallas, TX 75202 (US).			(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: NETWORK BASED METHOD AND APPARATUS FOR RESTRICTING OPERATION OF CELLULAR TELEPHONES TO DELINEATED GEOGRAPHICAL AREAS



(57) Abstract

The present invention provides a method and apparatus for restricting operation of a wireless telephone (130) to delineated geographical areas. The wireless telephone system (90) is equipped with a device for ascertaining (step 300) the geographical location of the wireless telephone (130). The ascertained geographical location is compared (step 305) against information pertaining to the authorization to operate the wireless telephone (130) in various geographical locations. A determination is made (step 310) as to whether operation is authorized and the wireless telephone (130) is instructed (step 330) by the wireless telephone system (90) to disable operation if unauthorized.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

- 1 -

NETWORK BASED METHOD AND APPARATUS
FOR RESTRICTING OPERATION OF CELLULAR
TELEPHONES TO DELINEATED GEOGRAPHICAL AREAS

5 CROSS-REFERENCE TO RELATED APPLICATION

 The present application is a continuation-in-part of co-pending U.S. Application Patent for Serial Number 08/759,997, filed on December 4, 1996, entitled "METHOD AND APPARATUS FOR RESTRICTING OPERATION OF CELLULAR
10 TELEPHONES TO WELL DELINEATED GEOGRAPHICAL AREAS," by Eric Valentine and Vladimir Alperovich.

 BACKGROUND OF THE INVENTION

Technical Field of the Invention

15 The present invention pertains in general to the planning and deployment of a wireless telephone system, and more particularly, to restricting the operation of wireless telephones to delineated geographical locations wherein the geographical location of the wireless
20 telephone is ascertained by the wireless telephone system.

Description of Related Art

 It is often desirable to prohibit operation of
25 wireless telephones in certain geographical locations. For example, use of wireless telephones is prohibited in airplanes while on a runway preparing for take-off. Operation is also prohibited in areas of hospitals where wireless telephone transmissions might interfere with life
30 critical equipment. Furthermore, as the service area of wireless telephone systems grow, such as through the use of satellite based systems providing national coverage, it is desirable to prohibit operation in larger geographical areas such as on military bases.

-2-

It has been proposed to equip wireless telephones with locating devices such as Global Positioning System (GPS) receivers which ascertain the geographical location of the wireless telephone. Service is then denied to mobile stations having an ascertained geographical location within a restricted area. Such systems, however, are expensive and the GPS receiver consumes the limited battery power available to wireless telephones. It would be advantageous therefore, to develop a method and apparatus wherein the wireless telephone system itself ascertains the location of the wireless telephone and controls the disabling of telephone operation when the telephone is located in an unauthorized location.

SUMMARY OF THE INVENTION

A wireless telephone system operates to ascertain the geographical location of wireless telephones. In a satellite based wireless telephone system, the wireless telephone system may ascertain the geographical location through a mapping of the position of the wireless telephone in a satellite reference coordinate system, and then converting the position to an earth reference coordinate system. In another embodiment, the wireless telephone system may ascertain the geographical location through triangulation using a plurality of satellites or base stations which monitor wireless telephone signal transmissions. Regardless of the mechanism used for the system to determine location, a comparison is made between the ascertained geographical location and database information pertaining to authorized/un-authorized geographical locations to determine whether telephone operation is authorized. A controller within the wireless telephone system then instructs the wireless telephone to disable itself when the wireless telephone is determined to be located in an unauthorized location and enable itself when located in an authorized location.

-3-

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the method and apparatus of the present invention may be acquired by reference to the following Detailed Description when taken in conjunction with the accompanying Drawings wherein:

Figure 1 is a diagram of a satellite based wireless telephone system incorporating the present invention;

Figure 2 is a terrestrial based wireless telephone system incorporating the present invention; and

Figure 3 is a flow diagram of a method for implementing the present invention in a wireless telephone system.

DETAILED DESCRIPTION OF EMBODIMENTS

Referring now to Figure 1, there is illustrated a satellite based wireless telephone system 90 including a plurality of the satellites 100A-C, a terrestrial portion 110 of the wireless telephone system 90, and a database 120. Each of the plurality of satellites 100A-C communicates with the terrestrial portion 110 of the wireless telephone system 90. Although more than one satellite of the plurality of satellites 100A-C may receive transmissions from a wireless telephone 130, typically only one satellite 100A communicates with the wireless telephone 130 at any given time. Communication between the wireless telephone 130 and a public switched telephone network 140 is established via the plurality of satellites 100A-C and the terrestrial portion 110 of the wireless telephone system 90. Also included in the terrestrial portion 110 of the wireless telephone system 90 is a first controller 150 which instructs a second controller 133 within the wireless telephone 130 to disable or enable operation based on the location of the wireless telephone 130.

Several methods are known in the industry for ascertaining the geographical location of a radio transmission source such as the wireless telephone 130.

-4-

For example, in a satellite based wireless telephone system a method known as Satellite To Earth (SATTOE) maps a position of the wireless telephone 130 in a satellite reference coordinate system and then converts the position to an earth reference coordinate system. The satellite to earth mapping operation uses a well known rotation transformation matrix, knowledge of a satellite antenna beam footprint, the position of the satellite, and the communication path of the satellite to determine a rough geographical location of the wireless telephone 130. To obtain the location of the wireless telephone 130 with a higher degree of resolution the satellite to earth mapping operation uses additional information such as the results of calculations performed on a Random Access Channel (RACH) and a Dedicated Control Channel (DCCH). Another well known method to determine the geographical location of the wireless telephone 130 in the satellite based wireless telephone system 90 uses two or more satellites 100A-C to triangulate the geographical location of the wireless telephone 130.

Using any known method, the wireless telephone system 90 ascertains the geographical location of the wireless telephone 130 and accesses the database 120 which contains information pertaining to the authorization to operate the wireless telephone 130 in the ascertained geographical location. Based on a comparison of the information contained in the database 120 against the ascertained geographical location, the first controller 150, which is part of the wireless telephone system 90, determines whether operation is authorized. If operation is unauthorized the first controller 150 transmits a command via the satellite 100 instructing the wireless telephone 130 to disable itself. The second controller 133, located in the wireless telephone 130, receives the command via a transceiver 132 and disables the wireless telephone 130. On the other hand, if operation is authorized the first controller 150, transmits a command via the satellites 100

-5-

instructing the wireless telephone 130 to enable itself. The second controller 133 receives the command via the transceiver 132 and enables the wireless telephone 130.

Referring additionally now to Figure 2, there is
5 illustrated a terrestrial based wireless telephone system 190 including a plurality of base stations 200A-C, a database 120, and a plurality of controllers 250A-C. Each of the plurality of base stations 200A-C communicates with the database 120. Although more than one base station of
10 the plurality of base stations 200A-C may receive transmissions from a wireless telephone 130, typically only one satellite 200A (Figure 1) communicates with the wireless telephone 130 at any given time. Also included in the base stations 200A-C are controllers 250A-C which
15 are capable of instructing the controller 133, located within the wireless telephone 130, to disable and enable operation of the wireless telephone 130.

Several methods are known in the industry for ascertaining the geographical location of the wireless
20 telephone 130 in a terrestrial based wireless telephone communication system. For example, the wireless telephone system can use two or more of the base stations 200A-C to triangulate the geographical location of the wireless telephone 130. Another approach uses knowledge of which
25 base station 200A is communicating with the wireless telephone 130 and Timing Advance (TA) information used in wireless communication between the base station 200A and the wireless telephone 130 to ascertain a rough estimate of the geographical location.

30 Using any known method, the wireless telephone system 190 ascertains the geographical location of the wireless telephone 130 and accesses the database 120 containing information pertaining to the authorization to operate the wireless telephone 130 in the ascertained geographical
35 location. Based on a comparison of the information contained in the database 120 against the ascertained geographical location, the controller 250A of the base

-6-

station 200A serving the wireless telephone 130 determines whether operation is authorized. If operation is unauthorized the controller 250A, located in the base station 200A, transmits a command instructing the wireless telephone 130 to disable itself. The controller 133, located in the wireless telephone 130, receives the command via the transceiver 132 and disables the wireless telephone 130. On the other hand, if operation is authorized, the controller 250A transmits a command instructing the wireless telephone 130 to enable itself. The controller 133, located in the wireless telephone 130, receives the command via the transceiver 132 and enables the wireless telephone.

Referring additionally now to Figure 3, there is illustrated a flow diagram of a method for implementing the present invention in a wireless telephone system. During operation of the wireless telephone the wireless telephone system periodically ascertains the geographical location of the wireless telephone (step 300). Any known method of ascertaining the geographical location of the wireless telephone can be used including, but not limited to, mapping the position of the wireless telephone in a satellite reference coordinate system to an earth reference coordinate system, or by triangulation using multiple components of the wireless telephone system. Once the geographical location is ascertained, the location is compared against database information pertaining to the authorization to operate in the ascertained location (step 305) and a determination is made as to whether operation is authorized (step 310). If it is determined that operation is unauthorized a controller within the wireless telephone system instructs the wireless telephone to disable itself (step 330). On the other hand, if it is determined that operation is authorized the controller instructs the wireless telephone to continue operation or enable itself if disabled (step 340).

-7-

5 Although embodiments of the method and apparatus of the present invention have been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the spirit of the invention as set forth and defined by the following claims.

- 8 -

WHAT IS CLAIMED IS:

1. An apparatus for restricting operation of a wireless telephone in a wireless telephone system based on a geographical location of the wireless telephone comprising:

means for ascertaining the geographical location of the wireless telephone, wherein the means is effectuated by the wireless telephone system itself;

a database communicating with the wireless telephone system for storing information pertaining to authorization to operate the wireless telephone in various geographical locations;

means for comparing the ascertained geographical location with database information to determine authorization to operate; and

means for disabling and enabling operation of the wireless telephone based on the determined authorization to operate.

2. The apparatus recited in claim 1, wherein the means for comparing the ascertained geographical location of the wireless telephone comprises a controller, located within a base station of the wireless telephone system, communicating with the database for comparing the ascertained geographical location against database information pertaining to authorization to operate in various geographical locations and determining whether operation is unauthorized or authorized.

3. The apparatus recited in claim 1, wherein the means for disabling and enabling operation of the wireless telephone comprises:

a first controller located within a base station of the wireless telephone system for transmitting a command instructing the wireless telephone to enable or disable operation; and

- 9 -

a second controller located within the wireless telephone for receiving the command transmitted by the first controller, the second controller enabling the wireless telephone when instructed to enable operation and
5 disabling the wireless telephone when instructed to disable operation.

4. A method for restricting operation of a wireless telephone in a wireless telephone system based on a
10 geographical location of the wireless telephone comprising the steps of:

ascertaining, by the wireless telephone system, the geographical location of the wireless telephone;

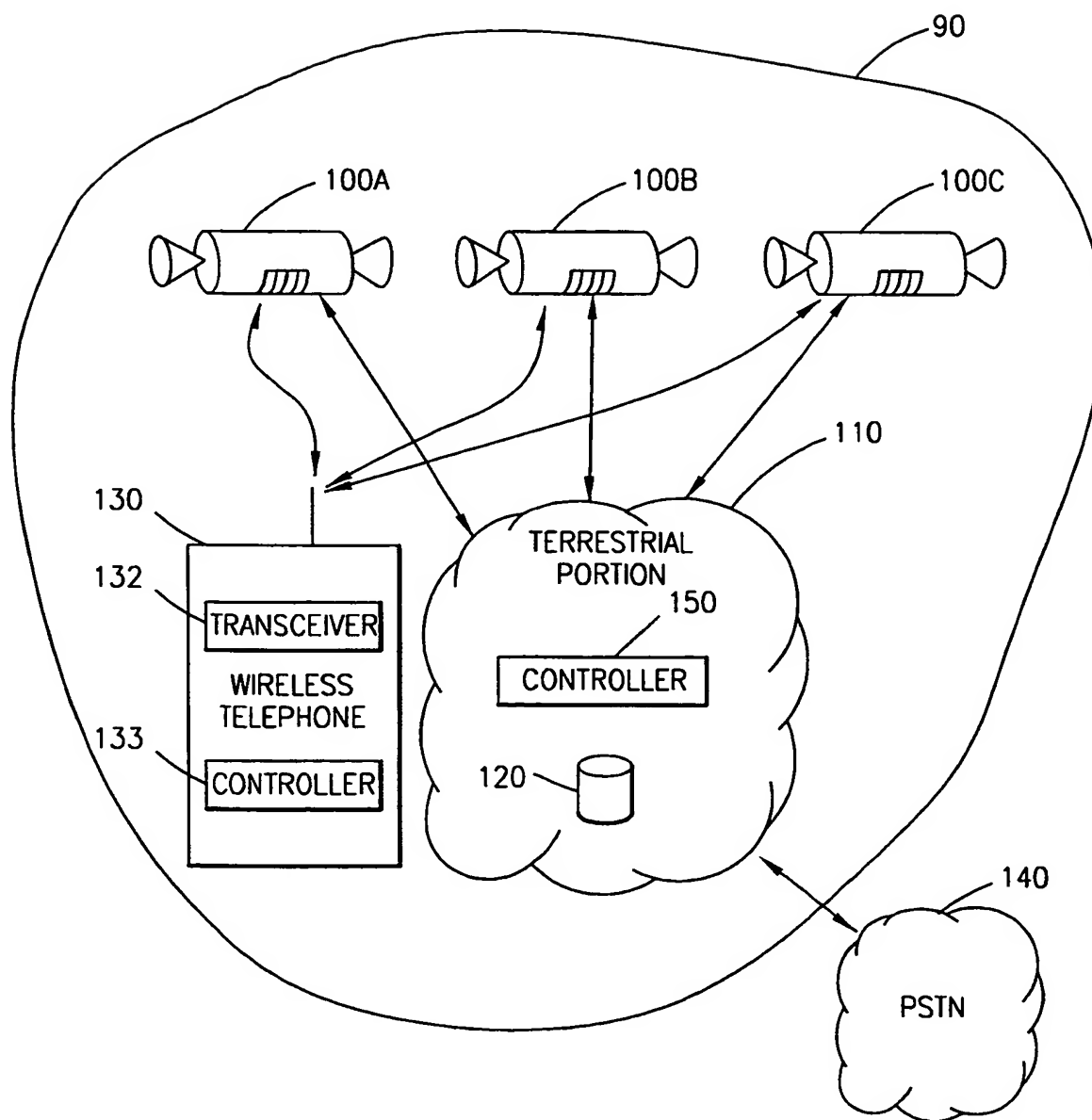
15 comparing, by the wireless telephone, the ascertained geographical location of the wireless telephone to information pertaining the authorization to operate the wireless telephone in various geographical locations;

20 determining, by the wireless telephone system, whether operation of the wireless telephone is allowed in the ascertained geographical location;

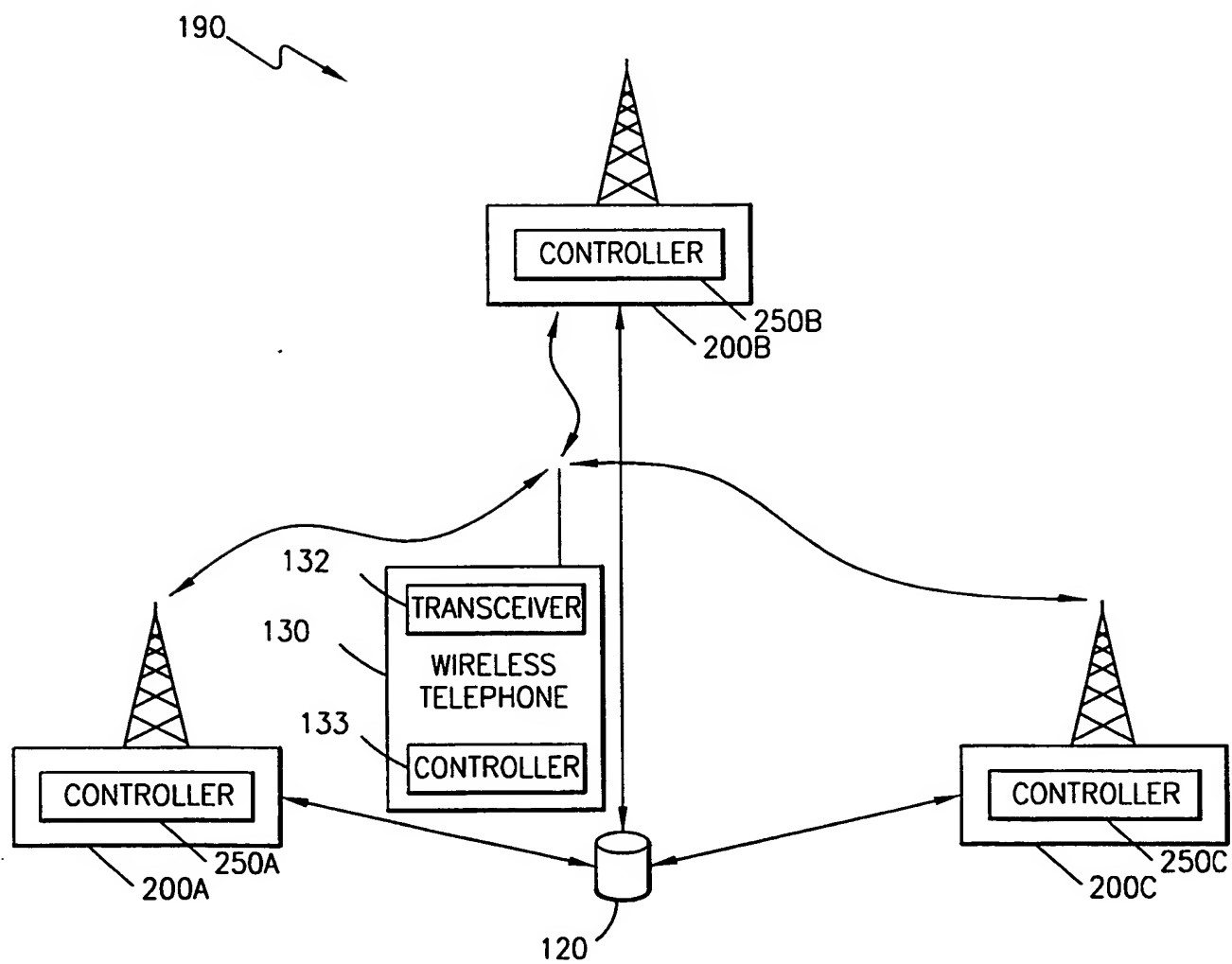
transmitting a command, by the wireless telephone system, instructing the wireless telephone to enable operation in geographical locations where operation
25 is authorized; and

transmitting a command, by the wireless telephone system, instructing the wireless telephone to disable operation in geographical locations where operation is unauthorized.

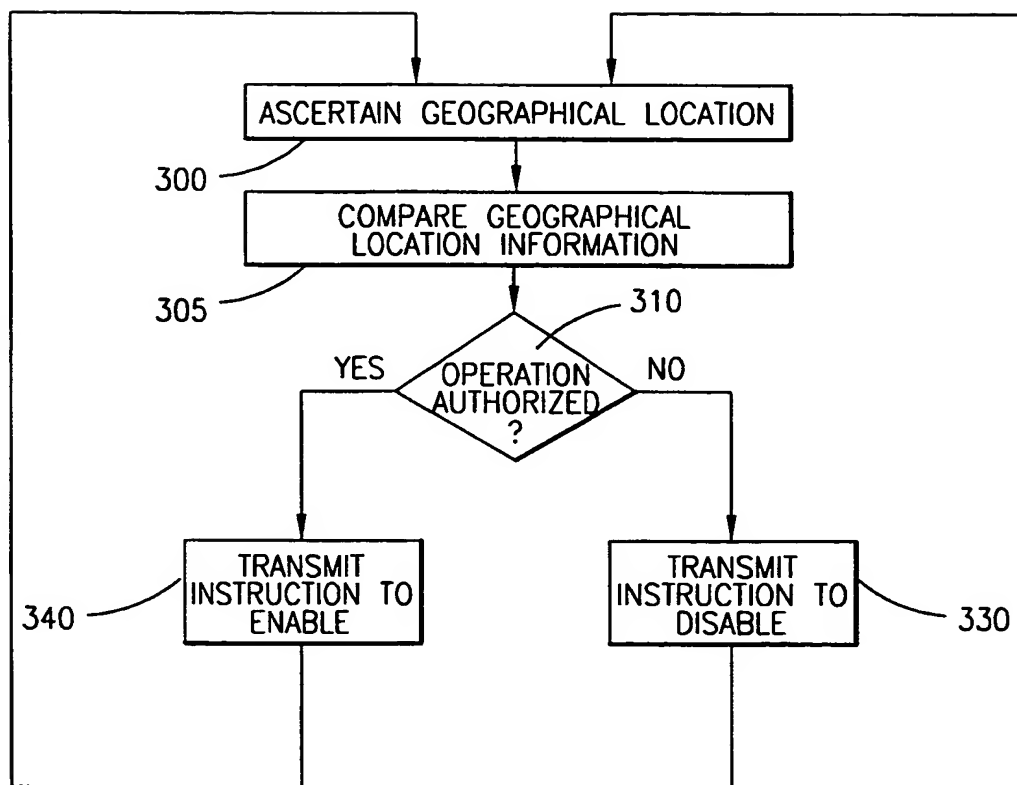
1/3

**FIG. 1**

2/3

**FIG. 2**

3/3

**FIG. 3**

INTERNATIONAL SEARCH REPORT

International Application No

/US 98/10777

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 300 787 A (NIPPON ELECTRIC CO) 13 November 1996	1,2
Y	see page 3, line 7 - page 4, line 8 see page 5, line 8 - line 23 see page 6, line 7 - line 15 see page 9 see abstract; claims 1-3; figure 2 ---	3,4
Y	US 5 442 805 A (SAGERS RICHARD C ET AL) 15 August 1995 see column 3, line 61 - column 4, line 34 see abstract; claims 1,5 -----	3,4

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

24 September 1998

Date of mailing of the international search report

30/09/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Coppieters, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/10777

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2300787	A	13-11-1996	JP 8307946 A	22-11-1996
US 5442805	A	15-08-1995	AU 4187789 A	01-05-1990
			CA 1317348 A	04-05-1993
			CN 1041676 A	25-04-1990
			WO 9004293 A	19-04-1990

Form PCT/ISA/210 (patent family annex) (July 1992)